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應用田口方法於鈦合金擠製加工之研究

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摘要

本文使用剛塑性有限元素模擬軟體研究鈦合金(Ti-6Al-4V)穿過圓錐形模具之軸對稱擠製加工塑性變形行為。本研究進行一系列的模擬分析，其模擬擠製條件包含模具入口半模角、胚料擠製比、摩擦因子和鈦合金溫度等，預測擠製過程中鈦合金胚料之破壞因子分佈、應力應變分佈、模具負荷大小和胚料流動速度分佈等。並且使用田口方法設計鈦合金擠製過程之最佳參數，分析結果希望能確認有限元素軟體對鈦合金擠製加工強健設計之適用性。

關鍵字: 有限元素;鈦合金;軸對稱擠製;田口方法

Study of Titanium Alloy Extrusion Processes Using the Taguchi Method

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Abstract

This paper employs rigid-plastic finite element software to investigate the plastic deformation behavior of titanium alloy (Ti-6Al-4V) during its axisymmetric extrusion through a conical die. Under various extrusion conditions, the present numerical analysis investigates the damage factor distributions, stress-strain distribution, die load and flow velocity of the billet at the exit. The relative influences of the semi-angle of the die, extrusion ratio, the friction factors and titanium alloy temperature, respectively, are systematically examined. This study applies the Taguchi method to optimize the process parameters for extrusion processes. The present simulation results confirm the effectiveness of the proposed robust design methodology for the extrusion processes of titanium alloy.

Key words: Finite element;Titanium alloy;Axisymmetric extrusion; Taguchi method